Rhodora

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DISTRIBUTION OF LITTORELLA AMERICANA IN THE MID-ARROWHEAD REGION OF MINNESOTA

OLGA LAKELA

Professor Fernald in separating *L. americana* from *L. uniflora* (L.) Asch.[1] refers to the plant as one of the rarest in North America, known only from a few localities throughout its range from Newfoundland to Minnesota. Until recently the collection of L. H. Bailey, no. 437, Basswood Lake, July 28, 1886 appears to have been the only record from the state.

L. americana first came to my attention while I was collecting in the "Roadless Area" of St. Louis County. Plants without flowers or fruit (no. 16743, August 9, 1953) were collected from a submersed colony with *Lobelia Dortmanna*, growing on a sandy bottom in shallow shorewaters of Iron Lake on the Ontario border. On the following day it was found again in Lac La Croix, at Beatty portage from Loon Lake. Plants in vegetative condition, no. 16756, were collected from a colony submersed in shallow water, again associated with *L. Dortmanna*. In each site the bottom soil was mostly a mixture of gray sand with black organic soil, peaty or mucky. Identification of the species in vegetative condition remained doubtful until 1957. In dealing with the known flora from Lake County for the manuscript of a *Flora of the Mid-Arrowhead Region*, Bailey's early collection of flowering plants was studied. This decisively cleared the identity of the sterile specimens.

In the ensuing search for additional flowering material in late season Basswood Lake seemed most accessible. Working from

[1] RHODORA 20: 61–62. 1918. *The North American Littorella.*

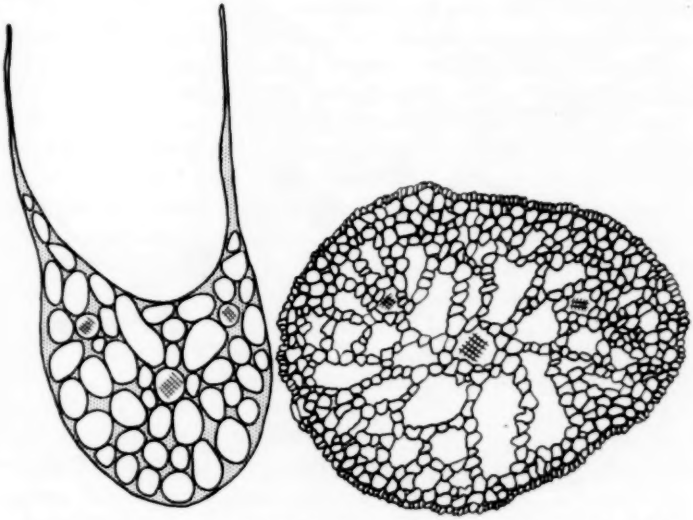
the Quetico-Superior Wilderness Research Center at Basswood Lake, after an extensive fruitless search of the more distant shores, *Littorella* was sighted without effort in the "home harbor" shore of the Center bay near the boat docks. The compact colony growing in silty sand was stranded above the water level. The associate species was *Ranunculus repens*. Coll. no. **22417**, Sept. **10, 1957**, consists of plants in late anthesis, with some mature fruits.

The label data of Bailey's collection lacks a specific location on Basswood Lake. The finding of the species there again temptingly invites one to visualize Dr. Bailey towering over the spot preferred by a persistent colony of *Littorella*. However, in reality, the occurrence of a solitary colony on a lake with several hundreds of miles shoreline is presumptuous.

L. americana was encountered again in Snow Bank Lake, located in the north central part of Lake County, about three miles south of the Canadian border. Here, in peaty sand of shallow waters of the bay south of the Resort, *Subularia aquatica*, in late flower and fruit, occurred in abundance with *Isoetes muricata*. Farther south in an adjoining bay some dozen plants of *Nymphaea tuberosa* were in full flower. Not far from the latter site on the sandy shore was an emersed colony of sterile *Littorella*, no. **22492** Sept. **14, 1957**. Perhaps it was the stranded part of a much larger submersed colony 5–10 feet from the beach at a water-depth of 2–3 feet which covered square yards of the sandy, cobblestone strewn bottom. The plants were clearly visible in the early morning sun, but almost beyond the reach of the collecting tool. Only a few plants dislodged from the seemingly hardened sediment floated to the surface with fragments of *Myriophyllum tenellum*.

It may be permissible to state here that botanizing is catching. On finding *Littorella* at the Quetico-Superior Research Center, the plants were shown to Mr. Otto Oltman, foreman, with a request that he try to find and collect the species during an anticipated canoe trip through the wilderness canoe country. His collection of *Littorella*, from the shore of an island in Malberg Lake about 4 miles west of Cook County, Sec. 8, T. 63, R. 6 W, September 19, 1957, was a welcome contribution to knowledge of this little known species. Thus within a space of a week,

three new localities were discovered. The Ontario site in the accompanying map is based on a sight record made September 2, 1956; circumstances prevented collecting at the time. The colony may be found on the shore of a small bay connected with Crooked Lake by a narrow channel, opposite Curtain Falls Resort Area.



LITTORELLA AMERICANA. Fig. 1, at left, sheathing leaf-base, × 30; tissues stippled, clear areas air-chambers or lacunae, vascular traces cross-hatched.

Fig. 2, at right, cross section of leaf near the middle, × 50; cells in outline only; epidermis without chlorophyll; (elongate cells with straight walls in face view not shown); stomata numerous throughout; mesophyll spongy with radial lacunae; traces cross-hatched.

In studying living plants of *Littorella* discrepancies in descriptions of leaves by different authors came to my attention. According to N. C. Fassett,[2] the leaves are "rather stiff dark thread-like." H. A. Gleason[3] notes their shape as "linear." In his illustration of the plant as a whole, they are depicted as being flat and thin. Professor Fernald features leaf morphology as one of the diagnostic differences between the American and European

[2] Manual of Aquatic Plants p. 313–314, 1940.

[3] The New Britton and Brown Illustrated Flora of the United States and Canada Vol. 3, p. 273, 1952.

species. In describing *L. americana*, he observed the leaves as "flattish, falcate-arcuate or straightish"; in *L. uniflora*, as "subterete or semi-cylindric."

It may not be amiss to place on record another description based on the study of living plants from five different localities. Mature fully turgid leaves are subulate, falcate-arcuate, lustrous,

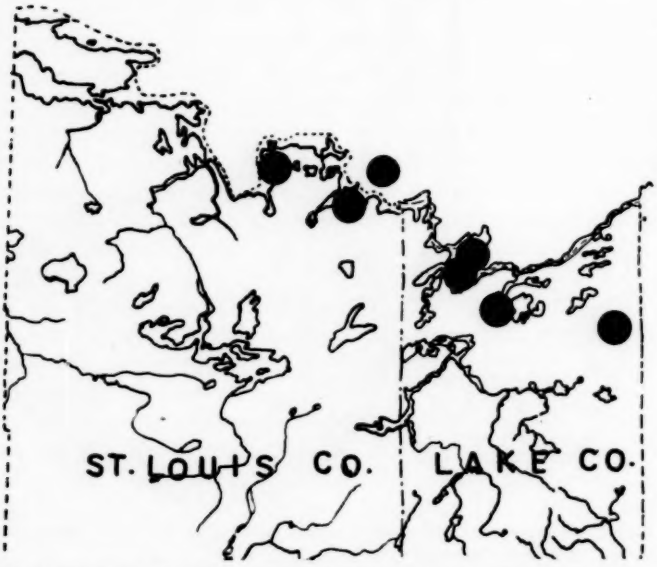


Fig. 3. The known sites of *Littorella americana*, in the upper portions of St. Louis and Lake Counties, mid-Arrowhead Region, Northeastern Minnesota.

bright green to yellowish green above the white bases. The blade distally above the shallow groove of the sheathing leaf-base, feels and looks terete, firm and pliable. The rich green tips of young leaves, two in alternate succession, embraced within the scarious-margined bases of opposing mature leaves are somewhat compressed but soon become subulate. Microscopically the mature leaves are nearly terete or at least more than semi-circular with concentric mesophyll centered about the median trace. The large air chambers appear to be radial; the two smaller traces are elevated above the median plane, cf. fig. 1 & 2.

Although *Littorella uniflora*, the European species has not been studied, descriptions of its leaves as, "subterete or semi-cylindric" indicates a similarity to those of *L. americana*. Otherwise, in floral structures and size Minesota plants well agree with Fernald's descriptions. The purplish-black fruit in maturity appears terete, apiculate with a short stipe and a minutely rugose pericarp.

Plants collected in late October show yellowing and gradual decay of the older leaves. Under greenhouse conditions the young leaves continue growth. The renewed overwintering rhizome of the season is 2–3 mm. thick and about as long; rhizomes of the previous years are persistent, subject to gradual decay. Whether the plants are stranded or submersed, they are readily recognized in field studies. The terete-appearing leaves, 1–2.2 mm. thick near the midpoint cannot be confused with *Ranunculus repens*.[2] Their outwardly-arching habit sets them apart from the linear-compressed obtuse leaves of *Lobelia Dortmanna*, which are broadly elliptic in cross-section, with two lacunae flanking the median trace.

The author is indebted to the Quetico-Superior Wilderness Research Center for courtesies pertinent to facilities for field studies, the Graduate School of University of Minnesota for defraying the cost of collecting and Dr. J. B. Carlson and Donald W. Davidson, Duluth Branch, for preparing the illustrations.—
UNIVERSITY OF MINNESOTA, DULUTH BRANCH.

EXPERIMENTS AND OBSERVATIONS BEARING ON EVOLUTION IN OENOTHERA

R. Ruggles Gates[1]

I

During an examination of the collections of *Oenothera* in the Gray Herbarium, Harvard University (Gates, 1957), a new species *Oe. perangusta* (Gates, 1950) was described from the North shore of Lake Superior. One specimen in the collection from Jackfish Station differed from the rest in having deep red stems and buds. It was recognized as a mutation parallel to the red-budded mutation from *Oe. Lamarckiana* (Gates, 1911)

[1] Cambridge, Mass.

and was therefore called *Oe. perangusta* var. *rubricalyx*. While in Vancouver, B. C., in 1953 I found in the herbarium of the University of British Columbia, through the courtesy of Professor Hutchinson, specimens of the same species and its red-budded variety originally collected from the same locality. On my way East I was able to stop at Jackfish, and had the good fortune to find the original locality from which the red-budded mutation was derived.

About 1400 feet east of Jackfish Station on August 28, 1953 near the railway, a colony of *Oenothera* was found in which were counted 7 plants with red stalks in fruit and many young rosettes also evidently of the red variety (as shown by the red colour ventrally on the midribs), as well as one plant of the ordinary type with green stems. A specimen was collected for the Gray Herbarium. The red plants in this clump must all have been descended from the original mutation. How old this colony is can only be conjectured, but Mr. Peter Leschuk, who managed the local hotel and afterwards sent me seeds on Sept. 28 when they were ripe, thought he remembered seeing the red form here as a boy. The clump might easily be destroyed by railway operations. Search of the area failed to reveal more than the one group of red plants.

In June, 1954, returning from Japan over the same route, many observations of *Oe. perangusta* were made. The species was very uniform all along the north coast of Lake Superior from Schreiber Station, where there were large colonies, to Terrance Bay, near Angler Station, at Marathon and along the C.P.R. line to Heron Bay. At the last locality were large numbers of plants in their favorite habitat, loose sand and gravel on the steep railway embankment some 400 yards west of the station. Nowhere were red plants seen except in the clump near Jackfish Station. The same species was afterwards seen growing by the railway near Hamilton, Ont. It thus evidently occupies a wide area in Ontario, from the north shore of Lake Superior to Hamilton on Lake Ontario and the Bruce Peninsula (Gates, 1950) of Lake Huron.

II

All the small-flowered Oenotheras, including nearly all the species in Canada, are self-pollinating. There is clear evidence,

however, that cross pollination occasionally occurs between different forms occupying the same area. Such crosses are an important factor in the evolution of the genus, and it is therefore desirable to obtain some evidence of the frequency with which cross pollination takes place in nature. For this purpose the ideal would be to use *Oe. perangusta* and its dominant red mutation, planting them in alternate rows and collecting open-pollinated seeds from the green form. Any plant with red buds derived from these seeds would then be the result of cross-pollination.

Before seeds of *Oe. perangusta* and its red form were available, this experiment was tried with *Oe. Victorini*, a species with somewhat larger flowers which may be somewhat less strictly self-pollinating. Seeds of *Oe. Victorini* were obtained from the Montreal Botanical Garden through the Director, Professor Jacques Rousseau, and of a strain of *Oe. blandina* containing the gene (*rubricalyx*) for red buds from Professor D. G. Catcheside. These were grown at the Bussey Institution, Jamaica Plain, Mass., the facilities being kindly provided by Professor Karl Sax of Harvard University. The two species were planted in four alternate rows, ten plants to each row. When the seeds were collected on September 15, 1953, only nine plants of *Oe. blandina rubricalyx* had flowered, mostly from side branches. They also came into flower later than *Oe. Victorini*. The 20 plants of this latter species all flowered and were full of seeds, many of the capsules having already shed some of their seeds. Since the species with red buds began flowering later, only the later seed capsules of *Oe. Victorini* were collected, four capsules from each of 12 plants.

As a partial control of the frequency of crossing, the number of capsules on 12 plants of *Oe. Victorini* was roughly estimated. They totalled 2305, with a range from 100 to 385 per plant. Estimating 300 seeds per capsule, a total of 691,500 seeds could have been exposed to "red" pollen in time to ripen before the frosts. It was judged that 10 lower capsules per *Victorini* plant or 36,000 seeds, were fertilized before the *blandina* pollen began to be produced. Subtracting this number leaves 555,500 seeds probably exposed to "red" pollen.

About four capsules each from eleven exposed *Victorini* plants were sown on vermiculite in the greenhouses of the Bussey Insti-

tution on Ooctober 2, 1953. On January 16, 1954, they had produced 3395 young rosettes, two of which had ventrally red midribs and would therefore have red buds. This gives a very tentative crossing frequency of 1:1698. Later attempts to get results on a large scale, using *Oe. perangusta* and its red variety, have not succeeded because the plants remained rosettes which failed to survive the winter season.

III

One incidental observation is worth recording. *Oenothera* flowers are generally visited by nocturnal moths after the flowers open in the evening. Their long proboscis enables them to suck up the nectar which is secreted in the hypanthium and fills the lower part of this tube. Bees may also be seen visiting *Oenothera* flowers. One bee which was carefully observed visited flower after flower in a routine way. Being unable to obtain the nectar at the base of the hypanthium in the normal way by sucking it up from the inside, it lighted on a petal, then walked down the slender hypanthium, punctured it at the base just above the ovary, and lapped up the nectar, leaving an ooze of nectar where its short proboscis had been withdrawn. The pollination mechanism was thus entirely bypassed, the bee obtaining the nectar without entering the flower. This was done with flower after flower on different plants as a regular routine. Whether this bee was exceptional in having discovered a way to circumvent the floral mechanism, or whether this is a general custom of bees in the New England area or elsewhere is unknown. It shows at any rate that some bees have developed an efficient method of their own for extracting the nectar from *Oenothera* flowers. The fact that each flower is punctured in the position to obtain the maximum amount of nectar from the nearly erect hypanthium, seems to show a mental activity closely akin to intelligence.

Literature Cited

Gates, R. R. 1911. Studies on the variability and heritability of pigmentation in Oenothera. Zeits. f. Abst. u. Vererb. **4**: 337–372.

———— 1950. Another parallel mutation in Oenothera. Canad. Field-Naturalist **64**: 142–145.

———— 1957. A conspectus of the genus Oenothera in North America. Rhodora. **57**: 9–17.

PLANT NOTES FROM ILLINOIS

Glen S. Winterringer

Several plant species of western United States have made their way into Illinois and have apparently become established, e.g., *Froelichia gracilis* (Hook.) Moq., *Callirhoe involucrata* (T. & G.) A. Gray, *Salvia pitcheri* Torr., *Salvia reflexa* Hornem. and several others. The newest arrival is *Phlox gracilis* (Hook.) Greene which according to William A. Weber is, "a common but inconspicuous weedy annual of the mesas and foothills". Such a habitat sounds strange when applied to plants collected in Illinois for this little weed was found in mid-May growing along the shoulder of a main highway west of Niantic in Macon County. It seems likely to the writer that this small weedy annual may have grown in the area for some time and has been overlooked. It would be interesting to know how the plant actually arrived in the Illinois area. In these days of superhighways and transcontinental travel it is not surprising that seeds or even plants are transported from one corner of the continent to another. What may be more important is the ability of a species, even a weed, to adapt itself in this new locality. Continued observations of this weedy Phlox will be made during subsequent growing seasons. Collection data. Macon Co.: May 12, 1957, shoulder of Highway No. 36, 2½ mi. W. of Niantic, *G. S. Winterringer 14003*. Another collection same locality May 16, 1957, *G. S. Winterringer 14001, 14002*. Specimens are in herbaria of the following: Illinois State Museum, Illinois Natural History Survey, and the University of Colorado.

The following items are listed either (a) they are new for the state or (b) they are very infrequently collected plants in Illinois. The writer expresses thanks to R. T. Rexroat of Virginia, Illinois, for his contribution of excellent botanical specimens.

Species New to the State

Scleria reticularis Michx. Cass Co.: east of Beardstown, Sept. 14, 1956, in sand at edge of peaty sand hole, *R. T. Rexroat 3438*. Specimen verified by Earl T. Core. In August, 1957, Rexroat reported an abundance of this species in the same area.

Falcaria sioides (Wibel) Aschers. Schuyler Co.: 2 mi. W. of Frederick, June 28, 1955, moist soil, *R. T. Rexroat 1800*. Verified by

Mildred E. Mathias. This species was not recently observed in the same area.

Infrequently Collected Plants

Aristida desmantha Trin. & Rupr. Morgan Co.: Oct. 12, 1956, E. of Meredosia; dry and sandy, *R. T. Rexroat 3516, 3517*. Cass Co.: Sept. 14, 1956, E. of Beardstown; sand, *R. T. Rexroat 3434, 3435*. Mason Co.: Oct. 9, 1955, W. of Saidora, sand, *R. T. Rexroat, 2426, 2403, 2427, 2428*. Oct. 18, 1954, with no definite county locality, dry sand, not common, *R. T. Rexroat 1294*. The Mason Co. specimens verified by Jason R. Swallen. Originally collected in Illinois by M. S. Bebb in 1861. Since that time it was collected by V. H. Chase in 1929 and by H. E. Ahles in 1950. The Morgan and Cass County locations are new.

Echinodorus parvulus Engelm. Cass Co.: Aug. 13, 1957, E. of Beardstown, moist peaty sand, *R. T. Rexroat 4150, 4151, 4152*. The collector reported numerous plants of this species in the area. Previous Cass and Mason County records are indefinite. A collection was made in St. Clair County in 1892.

Zizania aquatica L. Mason Co.: Aug. 19, 1956, S. of Havana; in shallow spring water, *R. T. Rexroat 3225, 3226*. The reason for reporting these collections is the apparently unusual length of the culms which, according to the collector, were from 11 to 13 ft. in length. Leaves, near the upper part of the culm, 2 in. wide and wider on the lower part.

Tradescantia bracteata Small. Mason Co.: May 31, 1953, SW. part of the county, in sand and sun, fls. blue, *R. T. Rexroat 182*, and same date, fls. rose, *R. T. Rexroat 763*.

Trillium recurvatum, forma shayi Palmer & Steyerm. Cass Co.: May 14, 1953, NE. of Virginia in woods, *R. T. Rexroat 85*.

Iris brevicaulis Raf. Morgan Co.: June 15, 1955, 10 mi. NW. of Jacksonville, wooded clay hillside, *R. T. Rexroat, 2008*. Cass Co.: June 6, 1955, NE. of Virginia, clayey woods, *R. T. Rexroat 2001*. Same locality June 8, 1955, *R. T. Rexroat 2002, 2003, 2004*. Same locality July 22, 1955, *R. T. Rexroat 2005, 2006, 2007* (with capsules).

Rubus laciniatus Willd. Mason Co.: July 14, 1957, E. of Bath, on a small sand dune with wild plum, *R. T. Rexroat 3981, 3982*.

Rubus phoenicolasius Maxim. Morgan Co.: May 31, 1956, 5 mi. SE. of Meredosia, *R. T. Rexroat 2735*. June 14, 1955, W. of Arenzville, *R. T. Rexroat 1776, 1777*. This introduced Rubus has been regarded previously as not established in Illinois. At the Arenzville locality the plants were abundant and thoroughly established over a considerable area.

Lotus corniculatus L. Cass Co.: June 4, 1953, sand, *R. T. Rexroat 201*. July 17, 1953, fence row in full sun, *R. T. Rexroat 383*. Mason Co.: July 8, 1956, 5 mi. S. of Havana, dry, peaty sand, *R. T. Rexroat 2988*. Brown Co.: August 30, 1956, N. of Cooperstown, clay hillside, *R. T. Rexroat 3344*.

CALLIRHOE INVOLUCRATA (T. & G.) A. Gray. Schuyler Co.: July 25, 1956, N. of Browning, clay; roadside, stems trailing 2–3 ft., *R. T. Rexroat 3099, 3100.*

ECHIUM VULGARE L. Schuyler Co.: June 28, 1955, 3 mi. S.W. of Frederick, clay hillside in pasture, *R. T. Rexroat 1807, 1808, 1809.* A few plants were observed in July 1957.

TRICHOSTEMA DICHOTOMUM L. Cass Co.: Sept. 17, 1953, no definite locality, moist sand, *R. T. Rexroat 684.* Aug. 19, 1954, peaty sand, dry or moist, *R. T. Rexroat 1358, 1102.* Sept. 8, 1955, 4 mi. E. of Beardstown, in peaty sand, *R. T. Rexroat 2285, 2286.* In these Cass County localities this species was abundant.

SALVIA PITCHERI Torr. Cass Co.: Sept. 11, 1954, near Virginia, dry soil, full sun, *R. T. Rexroat 1359.* Sept. 11, 1954, along R. R. tracks in full sun, perennial with several stems, *R. T. Rexroat 1188.* Sept. 10, 1954, R. R. tracks in full sun, *R. T. Rexroat 1189.* Sept. 23, 1955, near Virginia, dry clay soil, *R. T. Rexroat 2372, 2371, 2370.* Plants of the areas cited above have been destroyed but specimens transplanted to Rexroat's garden were in good condition in July 1957.

SALVIA REFLEXA Hornem. Woodford Co.: Aug. 6, 1957, 4 mi. S. of El Paso in an old pastured area, *G. S. Winterringer 13818, 13819.* The abundance of this adventive western sage in this locality was surprising. It was the dominant species over approximately an acre.

MENTHA ALOPECUROIDES Hull. Schuyler Co.: July 25, 1956, N. of Browning, clay soil, spreads by stolons, *R. T. Rexroat 3102, 3103.* Specimens transplanted to Rexroat's garden in 1956 are now thriving.

MIMULUS GEYERI Torr. Mason Co.: May 13, 1956, 5 mi. S. of Havana, growing in a spring-fed creek in an inch of water, forming a dense mat, *R. T. Rexroat 2612.*

All specimens cited in this paper are deposited in the Illinois State Museum Herbarium.—ILLINOIS STATE MUSEUM, SPRINGFIELD, ILLINOIS.

ARENARIA ROSSII AND SOME OF ITS RELATIVES IN AMERICA

Bassett Maguire

Recently, my colleague, Arthur Cronquist, collected a series of an interesting *Arenaria* of the *rossii*-complex in Montana that seemed to require special study. About the same time, William A. Weber sent to me collections from Colorado which bore on a related problem and required further consideration of the status of *Arenaria macrantha* (Rydb.) Nels. (also of the *A. rossii*-complex). Further, a recently published paper by Nannfeldt[1] raised questions as to taxonomic interpretation and status, and the typification and nomenclature of *Arenaria rossii*. All of these circumstances made necessary a review of the matter and require the present statement.

In his discursive paper, Nannfeldt has presented arguments purporting to establish the name (*Minuartia*) *rolfii* to supplant the long-used epithet *rossii*. Examination of historical materials at the British Museum (BM), Kew (K), Fielding Herbarium, Oxford (OXF), Gray Herbarium (GH), and The New York Botanical Garden (NY), and a large body of newly collected specimens on deposit at the National Herbarium (CAN) and the herbarium of the Department of Agriculture (DAO), both at Ottawa, the Gray Herbarium, and The New York Botanical Garden, has convinced us that there is but one polymorphic arctic American species involved, and that all of the Richardson specimens and those of the Parry Voyage belong to it. Accordingly, there is no necessity, or indeed permissibility, for nomenclatural change or substitution, since it is clear that Richardson did in fact effectively and validly publish the epithet *Rossii* (Franklin Journ. p. 738. 1823), and that neither the epithet nor the authorship by Richardson may be displaced.[2]

Arenaria rossii in the broad sense extends in the American Arctic from the Eastern Arctic Archipelago and northeast Greenland (also in Spitzbergen, acc. to Nannfeldt) westward to the Bering Straits and the Aleutian Archipelago, and in the moun-

[1] Nannfeldt, J. A. Some Notes on *Minuartia stricta* (Sw.) Hiern. and Allied Species. Nytt. Mag. Bot. 3: 159–170. 1954.

[2] This position was substantially taken by Porsild in Vasc. Pl. West Cana. Arctic Archipelago Bull. 135, Nat. Mus. Cana. p. 110. 1955.

tains in Alaska and Yukon south to Wyoming and Oregon. Clinal modifications take place westerly by which the sepals become acute, the petals narrower and shorter, and the leaves less fleshy. The occidental population has been known as *A. elegans*. The line of phytogeographic division between the two races seems to lie just west of the delta of the Mackenzie River, perhaps to the north of the Richardson Mountains.

In the Mackenzie Range and southward in the Rocky Mountain System, where the species is common, sepals become smaller and broader, petals inconspicuous or lacking, and the leaves remain more or less fleshy. This austral population, the ssp. *columbiana*, extends into Wyoming and Oregon. *Arenaria rossii* seems to be absent from the Middle Rocky Mountains and the Wyoming Basin (both as defined by Fenneman), i.e., from the Uinta and Wasatch Ranges in Utah, and possibly all of Wyoming, except the northernmost portion.

A taxonomic arrangement of the races of *A. rossii*, and a brief consideration of *A. macrantha* and its relatives, the southern complement of *A. rossii*, is provided herewith, and appended is a further provisional key[3] to the species of the *Arenaria rossii*—*A. stricta* complexes of America.

ARENARIA ROSSII Robert Brown apud Richardson.

A. rossii ssp. **rossii.**—*A. Rossii* R. Br. apud Richards. Append. Franklin Journ. p. 738. 1823, as to Richardson Arctic specimens; *A. Rossii* R. Br., in Chloris Melvilliana p. 14. 1823, as to the Parry Voyage Plants of Melville Island, and "*A. Rossii*, Richardson in Franklin's Journ. p. 738, paulo diversa est statura majore, . . . "; idem, R. Br. in Suppl. Parry's 1st Voyage p. 272 (cclxxii), 1824; "*A rossii*, Brown, Supp. Parry's Voy. cclxxii. No. 20. α Brown, l.c. nobis non visa.," and "β *A. Rossii* Frankl. App. 1 ed. p. 738, No. 170," Richardson, Append, Franklin Journ. ed. 2 p. 745. 1823; Hooker Fl. Bor.—Am. **1**: 100. 1831; *Alsine rossii* Fenzl, Verbreit. Alsin. 18. 1833; *Minuartia rossii* (R. Br.) Graebn. Syn. Mitteleurop. Fl. 51: 772. 1918; *Arenaria Rossii* R. Br. apud Richards. var. *Daethiana* Polunin, Bot. Can. East. Arctic Bull. Nat. Mus. Can. **92**: 201. 1940; *Minuartia rolfii* Nannfeldt, Nytt. Mag. Bot. **3**: 161. 1954.

In the northernmost part of its range, the subsp. *rossii* is characteristically a densely and closely pulvinate plant, infrequently flowering, and probably often reproducing vegetatively by means

[3] For a key to the genus see: Maguire, B., Arenaria in America North of Mexico. A Conspectus. Am. Mid. Nat. **46**: 494–498. 1951.

of easily detached short shoots borne in the axils of the primary leaves (discussed at length by Nannfeldt, l.c.). The type specimens of *Minuartia rolfii* Nannf. (*Simmons 2390*) are of this form.

More westerly, and perhaps generally in more protected places, particularly on the mainland, the plant tends to become more loosely tufted and, as observed by Porsild (in correspondence) flowers abundantly, and presumably matures seed. The specimens of Richardson represent both forms.

The specimens of Richardson (No. *170*, the types of *A. rossii*) collected on "Barren Grounds from Point Lake to the Arctic Sea," of which we have seen the material at Kew, the British Museum, the Gray Herbarium, the Oxford Fielding Herbarium, and The New York Botanical Garden, consist both of densely pulvinate and more loosely tufted specimens. Melville Island plants of the Parry Voyage, seen at the British Museum and Fielding Herbarium, are of the pulvinate form.

TYPE OF ARCTIC EXPLORATION SPECIMENS SEEN: coast, British North America, Dr. Richardson [*170*] 1819–22, "*Arenaria Rossii* Br.," (holotype, BM, photo CAN, the holotype sheet consisting of six specimens all of the more compact form); second sheet with three specimens (BM); "Arctic America, Frankl. Exp. (GH 2 sheets, K), the tufted form; [Franklin Journ.] No. *170*, Richardson (GH, NY), the tufted form; Melville Island, "Parry's 1 Voy. No. 20. Chloris Melvilliana p. 14. 1823." (BM, OXF), the pulvinate form. Ad Barren Vallies (lat. 76° 37′, long. 84° 25′) sinus Harbour Fjord, Ellesmerelandiae meridionalis in campis argillosis, July 28, 1900, *H. G. Simmons 2390* (GH, NY, isotypes of *M. rolfii* Nannf.).

DISTRIBUTION. Barren lands at low altitude, West Greenland, the Arctic Archipelago and the arctic coastal mainland to the Mackenzie River.

REPRESENTATIVE SPECIMENS. **Greenland:** Jacobsen Bay, Ymer Island, Aug. 11, 1932, *T. Sørensen 3312* (CAN); Dragon Point (82° 15′ N.), July 19, 1917, *Th. Wulff s.n.* (GH). CANADA. ARCTIC ARCHIPELAGO. **Baffin Island:** Arctic Bay, Sept. 8–11, 1936, *Polunin 2587* (GH); ? Cape Dorset, July 29, 1938, *Manning & Manning 19* (CAN); Hantzsch River, Sept. 3, 1938, *Manning & Manning 182* (CAN); Silliman Mt., July 11, 1948, *Senn & Calder 3924* (DAO), with characters of ssp. *elegans*. **Ellesmere Island:** Harbour Fjord, July 28, 1900, *Simmons 2390* (GH, NY, isotypes *Minuartia Rolfii* Nannf.); Craig Harbour, Sept. 16–17, 1934, *Polunin 872* (CAN); Eggerton Lake, Aug. 17, 1951, *MacDonald 18* (CAN); Hawkins Lake, July 17, 1951, *Bruggemann 202* (DAO); Parr Inlet, Aug. 8, 1951, *Bruggemann 252* (DAO); Wood Creek, Aug. 13, 1951, *Bruggemann 262* (DAO); Ward Hunt Island off n. coast Ellesmere I., 83° N., July 14, 1954, *Christie 50* (CAN). **Devon Island:** Dundas Harbour, Sept. 7, 1936, *Polunin 2554* (CAN). **Prince Charles Island:** Foxe

Basin, Aug. 15–18, 1949, *Baldwin 1939* (CAN). **King William Island:** 68° 47′ N., 97° 40′ W., Aug. 10, 1949, *Woodruff 144* (DAO); Victory Point, Aug. 8, 1954, *Cooper 112* (CAN); Aug. 17, 1955, *Cooper 151* (CAN). **Grinnell Land:** Lady Franklin Bay, *Greely 50* (GH). **Victoria Island:** Wollaston Pen., July 27, 1949, *Porsild 17216* (CAN); Holman Island trading post, Aug. 8, 1949, *Porsild 12278* (CAN); Albert Sound, Aug. 4, 1949, *Porsild 17384* (CAN). **Banks Island:** Cape Lambton, July 30, 1949, *Porsild 17554* (CAN); n.e. corner of island, Aug. 13–20, 1949, *Porsild 17667* (CAN); Bernard Island, Aug. 22, 1949, *Porsild 17749* (CAN); De Salis Bay, July 17, 1952, *Manning & Macpherson 16* (CAN). **Cornwallis Island:** Resolute Bay, July 31, 1949, *Collins 192* (CAN); 75° 15′ N., 96° 20′ W., in 1952, *Mackay 8* (CAN); Resolute Bay, July 30, 1949, *Schofield 446* (DAO). Melville Peninsula, Repulse Bay, July 25, 1950, *Bruggemann 69* (DAO). Spruce Bay, July 23, 1951, *Chillcott 56* (DAO). KEEWATIN DISTRICT. **Southampton Island:** South Bay, Aug. 22, 1936, *Polunin 2280* (GH), *2282* (GH); July 9, 1948, *Cody 1231B* (DAO); July 25, 1948, *Cody 1558* (DAO); July 28, 1948, *Cody 1637* (DAO); July 29, 1948, *Cody 1653* (DAO); Aug. 5, 1948; *Cody 1855* (DAO); Aug. 11, 1948, *Cody 2016* (DAO); July 15, 1948, *Cody & Senn 1338* (DAO); Ford River, Aug. 15, 1950, *Brown 213* (DAO). MACKENZIE DISTRICT. Bernard Harbour, Aug. 1915, *Johansen 367* (CAN); Great Bear Lake, Aug. 2, 1928, *Porsild & Porsild 5140* (CAN); Tree River, July 11, 1955, *Miller 94* (CAN); Coppermine, Aug. 4, 1951, *Findley 252* (DAO).

A. rossii subsp. **elegans** (Cham. & Schlecht.) Maguire, comb. nov. *Arenaria elegans* Cham. & Schlecht. Linnaea **1**: 57. 1826.

TYPE. Ad sinum St. Laurentii inter muscos et Dryadem crescens, *Chamisso no. 13*, p. 57, l.c.

DISTRIBUTION. Coastal and montane Alaska and Yukon of the Yukon River drainage. Variable. Specimens with flat ascending leaves 8–10 mm long and small flowers (sepals ca. 2.5 mm long), represented by *A. & R. A. Nelson 4080*, and *L. Viereck 1400* from Mt. McKinley National Park, and other like specimens, probably constitute a discrete well segregated variety.

REPRESENTATIVE SPECIMENS. CANADA, MACKENZIE DISTRICT. Richardson Mts., Aug. 15–17, 1933, *Porsild 6792* (CAN), *6793A* (CAN); Mackenzie Range, Sept. 9, 1944, *Porsild & Breitung 11804* (CAN); Canol Rd., Mile 111 east, July 25, 1944, *Wynne-Edwards 8294* (CAN). **Yukon Terr.:** Canol Rd., Mile 132, June 15, 1944, *Porsild & Breitung 9609* (CAN); Canol Rd., Mile 105, July 21, 1944, *Porsild & Breitung 10891* (CAN). **Alaska.** Miller House, 115 miles n. Fairbanks, July 22–28, 1936, *Scamman 168* (GH); July 24, 1947, *Scamman 482* (GH); July 14, 1947, *Scamman 4695* (GH). Brooks Range, *Jordal 3605* (CAN). Eagle Summit: July 7–11, 1937, *Scamman 756* (GH); July 12–28, 1940, *Scamman 2074* (GH); Aug. 1–9, 1940, *Scamman 2247* (GH); June 23–30, 1945, *Scamman 3514* (GH); July 13–15, 22–23, 1949, *Scamman 5195* (GH); June 25, 1948, *Lepage 23277* (CAN, DAO). White Mts., July 7, 1953, *Gjaerevoll 456* (CAN). Alaska Range, June 19, 1926, *Porsild & Porsild 225* (CAN). Mt. McKinley Nat. Park: Aug. 8, 1939, *A. & R. A. Nelson 4080* (GH, NY); July 17, 1956, *Viereck 1400* (COLO, NY); July 10, 1956, *Viereck 1191* (COLO, NY). Seward Peninsula: Cape Nome, in 1900, *F. E. Blaisdell s. n.* (GH, NY); Upper Kougarok River, June–July, 1909, *C. B. Atwater s. n.* (GH); Nome, Aug. 6–10, 1926, *Porsild & Porsild 1336* (CAN,

GH); Nome, Anvil Hill, Aug. 6–10, 1926, *Porsild & Porsild 1334* (CAN), *1335* (CAN, GH); Bluff, Aug. 5–6, 1926, *Porsild & Porsild 1222* (CAN); Nome, Anvil Hill, Aug. 9, 1948, *Lepage 23895* (CAN, DAO); Nome, June 20, 1951, *Whillans 52* (DAO). Norton Sound, July 16–29, 1926, *Porsild & Porsild 984* (CAN, GH). Port Clarence, Aug. 6–20, 1949, *Scamman 5481* (GH).

A. rossii subsp. **columbiana** (Raup) Maguire comb. nov. *A. rossii* var. *columbiana* Raup, Contr. Arnold Arboretum **6**: 157. 1934.

TYPE. Wet stones in sun at 5500 ft., Pass n. of Robb Lake, British Columbia, *Mrs. J. Norman Henry 262* (GH).

DISTRIBUTION. The petaliferous element, montane, the Stikine Mountains, Yukon, south in the Rocky Mountains to Colorado.

REPRESENTATIVE SPECIMENS. CANADA. **British Columbia.** N. Kootanie Pass: July 29, 1883, *Dawson 656A* (CAN); *Dawson 665* (CAN); Rainbow Mts., July 16, 1898, *Spreadborough 19291* (CAN, GH); Robb Lake, July 25, 1932, *Henry 262* (GH, holotype of *A. rossii* var. *columbiana* Raup); Mt. Selwyn, July 19, 1932, *Raup & Abbe 3951* (CAN, GH, NY); *Raup & Abbe 3761* (CAN, GH); Laurier Pass, July 22, 1935, *Henry 718* (GH); Alaska Highway, Mile 456, *Porsild 9010* (CAN). **Alberta.** Moose Mt., June 29, 1897, *Macoun 18266* (CAN, GH); July 1, 1897, *Macoun 18267* (CAN); Crow's Nest Pass, Aug. 2, 1897, *Macoun 18270* (CAN); June 30, 1897, *Macoun 268* (CAN); Saddle Mt., Banff Nat. Park, July 31, 1891, *Macoun 4868* (CAN); Waterton Lake, July 11, 1931, *A. S. Pease 22570* (GH); Banff Nat. Park, July 13–22, 1946, *Porsild & Breitung 15886* (CAN); *15977* (CAN).

A. rossii subsp. **columbiana** var. **apetala** Maguire, Am. Mid. Nat. **46**: 510. 1951.

TYPE. Alpine meadow, Preston Park, alt. 7520 feet, Glacier Park, Montana, July 20, 1932, *Maguire 732* (*holotype* NY).

DISTRIBUTION. The apetalous element, forming extensive local populations, British Columbia, Alberta, Montana, and possibly northwestern Wyoming. Commonly more compact, and more frequently collected than the preceding. A single collection is known from the Wallowa Mts., Oregon, and a diminutive specimen, *J. T. Howell 22773* from Mono Mesa, Inyo Co., Calif., has seed and flower characteristics of the var. *apetala*, and is tentatively assigned here.

REPRESENTATIVE SPECIMENS. CANADA. **Yukon Terr.,** Canol Rd., Mile 102, July 19, 1944, *Porsild & Breitung 10615* (CAN). **Alberta.** Crow's Nest Pass, Aug. 2, 1897, *Macoun 18271* (CAN), *18296* (CAN); July 31, 1897, *Macoun 18271* (CAN). Upper Red Deer River: July 12, 1951, *Porsild 18175* (CAN); July 12, 1951, *Porsild 18306* (CAN). Coleman, July 6, 1956, *Porsild & Lid 19351* (CAN). Mt. Inglismoldie, July 1, 1916, *Lewis 296* (CAN). Banff Nat. Park, *Porsild & Breitung* in 1945; Sulphur Mt., *12432* (CAN); Mt. Temple, *12554* (CAN); Sunshine Ski Lodge, *13161* (CAN); *13423* (CAN); *13469* (CAN); *31470* (CAN); *14102* (CAN); *15885* (CAN); Mt. Bourgeau and Mt. Brett, *13802* (CAN); Cascade River, *14950* (CAN); Upper North Saskatchewan River, *16056* (CAN); Brewster Hill, *19464* (CAN); Citadel Mt., *19555* (CAN); Sulphur Mt., June 14, 1906, *S. Brown 146* (GH, NY). Waterton Lake: Sheep Mt., July 28, *Macoun 10098* (CAN); Sept. 6, 1953, *Moss 10516* (CAN); Carthew Pass, July 26, 1953, *Breitung 16689* (NY). Jasper Nat.

Park, Medicine Lake, Aug. 7–9, 1941, *Scamman 2528* (GH). UNITED STATES: **Montana.** Glacier Nat. Park: Mt. Jackson, Aug. 24, 1920, *Somes 70* (NY); Piegan Pass, July 20, 1930, *Pease 22194* (GH); Preston Park, July 20, 1932, *Maguire 732* (NY, holotype *A. rossii* var. *apetala* Maguire); Logan Pass, July 16, 1934, *Jones 5523* (GH). Mt. Henry, Midvale, July 16, 1903, *Umbach 406, in part* (NY). Beaverhead Co.: Black Lion Mt., July 30, 1945, *Hitchcock & Muhlick 12908* (NY). Big Snowy Mts., July 6, 1945, *Hitchcock & Muhlick 12037* (NY); Pintlar Peak, July 27, 1945, *Hitchcock & Muhlick 12869* (NY). Bridger Mts., June 5, 1897, *Rydberg & Bessey 4050* (NY, 2 sheets). Big Horn Mts., July 1898, *Tweedy 162* (NY); Beartooth Mts., Carbon Co., July 29, 1955, *Cronquist 8003* (NY, GH, US, UC, WS, WTU, COLO, K, P). **Oregon.** Wallowa Mts. July 31, 1899, *Cusick 2299, in part* (GH). **Wyoming.** Northwestern Wyoming Expedition, in 1873, *Parry 40* (GH).

ARENARIA MACRANTHA AND ITS RELATIVES

As shown above, *Arenaria rossii*, occupying the American trans-Aretic region and northern Rocky Mountains, apparently does not extend into the Middle Rocky Mountain area of Wyoming and Utah (the Uinta and Wasatch Ranges), or the Wyoming Basin. Apparently the range of *A. macrantha*, which replaces *A. rossii* in the south, and its relatives are confined to the southern Rocky Mountains and Colorado Plateau region (as defined by Fenneman) and do not occur in the Middle Rocky Mountain area. Thus, the Middle Rockies form a broad spacial hiatus between the ranges of the two closely related complexes.

From the material of the complex now available, two elements stand out more strongly, viz., that represented by the specimens of the type collections of *A. macrantha* from Montezuma County, Colorado, and of *A. filiorum* from Iron County, Utah.

Arenaria macrantha (Rydb.) Nels. Man. Bot. Rocky Mts., p. 186. 1909. *Alsinopsis macrantha* Rydb. Bull. Torrey Club 31: 407. 1904.

TYPE. Common alpine form, Little Kate Basin, La Plata Mts., Montezuma Co., Colorado, July 14, 1898, *Baker, Earle & Tracy 678* (holotype NY, isotype NY).

The types, consisting of four plants on two sheets at The New York Botanical Garden, are luxuriant specimens, obviously perennial, with numerous procumbent stems to 10 cm long; conspicuous flowers borne in 3 (5)-flowered cymes; sepals broadly lanceolate, 4.5–5.0 mm long, 2 mm broad, acuminate, strongly 3-nerved; petals conspicuously exceeding the sepals, 7–8 mm long; and leaves more or less plane, strongly 1-nerved, blunt. No mature capsules had been formed, consequently seeds are lacking. Collections recently obtained show the species, as expected, to be somewhat variable in habit, leaf-form, and range of flower size. Two of them have formed mature capsules and seed.

Adequate circumscription is now possible: leaves may be more or less plane (as in the types) or triquetrous-subulate; sepals 4.0–5.5 mm long; petals ordinarily conspicuously surpassing the sepals; seed reniform ca. 1 mm broad, tesselate-tuberculate, blackish.

DISTRIBUTION. Alpine or similar habitats, mountains of the Southern Colorado Rockies.

Representative specimens, Colorado. Gray's Peak, *A. Eastwood s.n.*, in July 1888 (COLO); alpine, South Park, *Wolf & Rothrock 346* (GH). Park Co., Hoosier Ridge, *Weber, Rollins & Livingston 655* (COLO); tundra, North Star Mountain, Hoosier Pass, ca. 12,300 ft. alt., *Weber 8751* (COLO); Bald Mt., 11,500 ft., Aug. 1898, *E. A. Bessey s.n.* (NY); Bald Mt., Aug. 28, 1954, *Jean Langenheim 3968* (COLO). Clear Creek Co. *Weber & Dahl 8613*, depauperate specimens, (COLO). Gunnison Co. Travertine bog and cliffs, Cement Creek Canyon, ca. 8500 ft., *Weber & Langenheim 9520* (COLO); Horse Basin, 11600 ft., *Langenheim 70* (COLO); alpine, Comanche Creek at 12000 ft., *Langenheim 1361* (COLO). Pitkin Co. ridge east of Avalanche Creek, 12000 ft., *Langenheim 2106* (COLO, NY). Montezuma Co. Little Kate Basin, *Baker, Earle & Tracy 678* (holotype NY, isotype NY). San Juan Co. Near Irontown, July 21–31, 1899, *C. C. Curtis s.n.* (NY).

Hall & Harbour No. 69, Lat. 39°–41°, Colorado, in 1862 (GH), an apetalous form with 1–3-flowered cymes and reddish slightly sculptured seed, can hardly be assigned to *A. macrantha*. It is similar to a few scattered collections obtained from the Northern Rocky Mountains and Canadian Rocky Mountains (viz.: *Porsild & Breitung 10615* (CAN), an apetalous form from Mile 102, Canol Road, Yukon Terr.; and *Spreadborough 19290* (CAN), Rainbow Mt., Fraser River, B. C., petalous form), which are rare, sporadic and do not form populations, and have for the time being been assigned to *A. rossii* subsp. *columbiana*.

Arenaria filiorum Maguire, Bull. Torrey Club **73**: 326. 1946.

TYPE. Common, gravelly beach, Navajo Lake, Iron County, Utah, July 13, 1940, *Maguire 19472* (holotype NY, isotype GH, UTC, UC).

Small glabrous annual from a slender taproot, with cymes usually bearing 3–5 flowers; sepals are ovate-lanceolate, strongly 3-nerved, and are 3.5–4.8 mm long; petals more or less equaling or shorter than the sepals; seed abundantly produced 0.7–1.0 mm broad, reniform, very dark reddish brown or blackish, rather strongly sculptured (in contrast to the seed of *A. rossii*).

This highly distinctive form occurs intimately with *A. rubella*, where both hold dominance on the gravelly beach of the lake. Quite similar plants, *L. Ellison 4523* (NY), Island Lake, San Pete County, were collected also on gravelly lake beaches.

Elsewhere from the high Colorado Plateau of Utah, viz., *Maguire 19988* (NY), 10928 ft. alt., Mayfield Canyon, and *Maguire 20060* (NY), 12000 ft. alt., Horseshoe Mt., both in San Pete County, and *Maguire*

20097 (NY), East Brian Head Peak, 11000 ft. alt., Iron County, are somewhat similar plants but obviously perennials. They most closely resemble small-flowered members of the complex cited above from Colorado, but are distinguishable in minor ways from them.

A series of specimens obtained from the Charleston Mts., Clark Co., Nevada, *Clokey 5460* (NY), *7510* (NY), and *7923* (NY), collected in 1935, 1937 and 1938 respectively, are obviously perennial with commonly uniflorous cymes. They were initially assigned to *A. filiorum* but are easily recognizable as distinct from it. They are extremely uniform and certainly form a geographically restricted race, yet undoubtedly belong to the *A. macrantha-filiorum* complex.

A Key[4] to the Arenaria rossii-A. stricta[5] Complexes and Their Relatives in North America

1. Seed reniform (with respect to the hilum), hence broader than long; plants completely glabrous.
   2. Seed smooth or inconspicuously ornamented (under × 10 magnification), pale, reddish, 0.5–0.7 mm broad, cymes uniflorous, ebracteate. ..... *A. rossii.*
      3. Sepals commonly 1.5–2.5 (3.0) mm long, oblong-ovate, obtusish, usually 1-nerved;[6] petals conspicuously surpassing the sepals; cymes uniflorous, ebracteate; pedicels 5–20 mm long; leaves fleshy, subulate, obtuse, 2–4 mm long; densely pulvinate or tufted plants of (Spitzbergen and) Arctic America; Greenland, Arctic Archipelago, and Arctic Coastal America to the Mackenzie River Region. ..... *A. rossii* subsp. *rossii.*
      3. Sepals commonly 3.0–3.5 mm long, lanceolate, acute, commonly 3-nerved; pedicels 2–4 (5) cm long; leaves less fleshy, more or less plane, acutish, petals narrower, equaling or commonly somewhat shorter than the sepals; loosely tufted plants of Alaska, Yukon in the Yukon River drainage, and probably the Richardson Mountains. ..... *A rossii* subsp. *elegans.*

[4] This "key" is intended to supplement, by introducing some corrections and additions, the key offered by me in 1951 (l.c.). In no sense do I mean to imply that the species herein admitted are necessarily more strongly intra-related, than to or with other members of the Sect. *Alsine.*

[5] Dr. A. E. Porsild in correspondence of Aug. 6, 1957, wrote, "I wonder if you are not overlooking that *Minuartia stricta* (Sw.) Hiern. is not the same as *Arenaria uliginosa* Schleich and certainly not synonomous with *A. stricta* ssp. *dawsonensis* as suggested by you (1951)." Both from lack of material and opportunity to extend the present study, I cannot have a competent self-gained opinion on the point. In view of Dr. Porsild's broad knowledge of boreal American plants, and his careful study, I am quite content to accept his interpretation of plants so indicated by him. Obviously, this would require the addition of *A. uliginosa* to my "key" of 1951; and indeed also *A. macrantha* (Rydb.) Nels., there inadvertently omitted by me.

[6] Anatomically the sepals in the entire complex are 3-nerved. The lateral nerves may be prominent, or weakly developed. Or, the lateral nerves may be obscured, in more crassulous sepals, by relatively thicker mesophyll tissues, thus in appearance the sepal becoming "1-nerved." The terms "3-nerved" or "1-nerved" merely give expression for relative prominence of the lateral nerves.

3. Sepals 2.5–3.5 mm long, lanceolate or ovate-lanceolate, acutish, moderately or weakly 3-nerved, or often 1-nerved; petals inconspicuous, narrow, shorter than the sepals, often lacking; leaves more or less fleshy, triquetrous or subulate; Rocky Mountains from the Stikine Mountains south to Oregon and northern Wyoming. ..... *A. rossii* subsp. *columbiana.*
4. Petals present ..... var. *columbiana.*
4. Petals lacking ..... var. *apetala.*

2. Seed obviously tesselate-tuberculate (under × 10 magnification), blackish, (0.8) 1.0–1.5 mm broad; cymes commonly 3-several-flowered, bracteate; sepals strongly 3-nerved.
5. Stems mostly under 10 cm high (or long), the inflorescence shorter than the vegetative portion of the stem, cymes commonly 3–5-flowered.
6. Plants glabrous.
7. Obviously perennial; cymes 1–3-flowered, flowers large, showy; sepals 4.0–5.5 mm long, lanceolate, acute; petals commonly exceeding the sepals, to 8 mm long; plants rather densely tufted; mountains of central and southern Colorado and the type collection from the La Plata Mountains, Colorado. ..... *Arenaria macrantha.*
7. Annual or weakly perennial; flowers not showy; cymes 3–7-flowered; sepals 4.0–5.5 mm long; petals shorter than the sepals; apparently restricted to the high Colorado Plateau of southcentral Utah. ..... *A. filiorum.*
6. Plants conspicuously glandular; circumboreal. ..... *A. rubella.*
5. Stems 10–30 cm high; primary leaves 1–2 cm long; inflorescence characteristically exceeding the hyaline portion of the stem; sepals 3.5–5.0 (6.5) mm long, 3-nerved, rarely 1-nerved; petals 5–8 mm long; seed 0.8–1.5 mm broad. ..... *A. stricta.*
8. Plants totally glabrous, strongly perennial.
9. Petals conspicuously surpassing the calyx; capsule equal to or shorter than the calyx.
10. Stems leafy for more than half their length; primary leaves usually 1.5–3.0 cm long; plants mostly lax, frequently matted. .... *A. stricta* subsp. *stricta.*
10. Stems leafy usually below the middle; primary leaves mostly 0.5–1.5 cm long; plants rigid, not matted. ..... *A. stricta* subsp. *texana.*
9. Petals equal to or mostly shorter than

the calyx; capsule exserted. .... *A. stricta* subsp. *dawsonensis.*

8. Plants glandular-pubescent, at least in the inflorescence, weakly perennial. .... *A. stricta* subsp. *macra.*

1. Seed oblong (with respect to the hilum), hence longer than broad.

11. Primary leaves 3-nerved, non-glaucous; inflorescence stipitate-glandular, half or less than half the length of the glandular stem; sepals 3.5–6.5 mm long; ovules 9–15; seed several or solitary, oblong, 1.0–1.3 mm broad, 1.25–2.0 mm long; widespread in the Rocky Mountain, Intermontane, and Cascade-Sierra Nevada region of western America, in the mountains from British Columbia and Alberta to California, Nevada, Utah and Colorado. ..... *A. nuttallii.*

12. Leaves ascending or strict, neither arcuate nor squarrose.

13. Leaves abruptly acute or apiculate, infrequently pungent; sepals acuminate, midrib not prominent.

14. Petals shorter than the sepals; Cascade Range, Rocky Mountains. .. *A. nuttallii* subsp. *nuttallii.*

14. Petals longer than the sepals; north California coast ranges, Siskiyou Mountains. .. .. *A. nuttallii* subsp. *gregaria.*

13. Leaves strongly pungent; sepals narrow, pungently attenuate, midrib prominent; Sierra Nevada Range. ..... *A. nuttallii* subsp. *gracilis.*

12. Leaves arcuate or squarrose.

15. Sepals 3.5–5.5 (6.0) mm long, lanceolate, sometimes broadly so, acuminate, 1-nerved (occasionally 3-nerved); petals shorter than the calyx; Cascade Range, Rocky Mountains. ..... *A. nuttallii* subsp. *nuttallii.*

15. Sepals 5.5–6.6 mm long, narrowly lanceolate, pungently attenuate, 3-nerved; petals more or less equaling the calyx; central Great Basin. .... *A. nuttallii* subsp. *fragilis.*

11. Primary leaves 1-nerved; glaucous; inflorescence diffuse, exceeding the length of the glabrous stem; sepals 3.0–4.5 mm long; ovules 6 (7); seed solitary, 1.4–1.5 mm broad, 2.3–2.8 mm long; plants of serpentine areas, Coast Ranges, Trinity County, California. ..... *A. rosei.*

Rumex stenophyllus in North America.—Two specimens of *Rumex stenophyllus* Ledeb. have been discovered in a collection of plants from Manitoba. They were found growing in a roadside ditch not far from the village of Otterburne, about 30 miles SE of Winnipeg, and were collected by the junior author on Aug. 21, 1950.

Rumex stenophyllus Ledeb. is a continental Eurasiatic species, native to eastern and western Siberia, central Asia, eastern and middle Europe to lower Austria, Moravia and central Germany (Rechinger 1949). It is occasionally introduced into Scandinavia (cf. Hylander 1955), Holland (cf. Rechinger 1949), and England (cf. Clapham, Tutin & Warburg 1952). The most favorable habitats are roadside ditches and other places, where the soil is slightly saline and occasionally flooded. At times the plant spreads to road shoulders and wastelands, or may even become a field weed.

The Red River valley, where the plant was found, was originally settled by French-Canadian farmers, but early this century a great influx of immigrants came from the Ukrainian parts of central and eastern Europe. Like other immigrants, these Ukrainian farmers brought their own grain, which included an assortment of weeds. Although this alien flora still is not fully known, it includes some very well naturalized species, like e.g. *Sonchus uliginosus* M. B., which is now widespread all over the marshes of central Canada and the adjacent United States. *Rumex stenophyllus* apparently also belongs to this group of species, although its occurrence is not as evident as that of the conspicuous *Sonchus*. Only a single locality of *Rumex stenophyllus* is known so far from Manitoba, but the plant is undoubtedly more widespread. The valleys on the prairies with their slightly saline and repeatedly flooded soils certainly offer conditions very much like those of its original habitat.

According to Frankton (1955, and in litt.) the species is not uncommon in Saskatchewan, where it was first discovered a few miles north of Swift Current in 1954, when seed collections were sent in for identification by Mr. A. Budd. In the herbarium of the Dept. of Agriculture, Ottawa, specimens from the following states have also been uncovered: Colorado, Nebraska, Wyoming, N. Dakota, S. Dakota and Minnesota, under the fol-

lowing names: *R. obtusifolius, brittanica, pulcher, alluvius* and *odontocarpus. R. odontocarpus* (cf. Moore, 1957) and *R. alluvius* (cf. Gates & McGregor, 1950; Rechinger, 1952) are synonyms to *R. stenophyllus.*

Due to the fact, that the species has been the object of so much confusion, it seems appropriate to repeat in translation the detailed description given in latin by Rechinger (1949):

"Root fusiform, vertical, perennial (occasionally the plant flowers during its first year?), stem stiffly erect, 20–60 (–120) cm. tall, brownish or reddish, sulcate-striate, leafy, often divided above the middle into several branches, but in depauperate specimens sometimes subsimple. Branches erect, or erect-divergent, very rarely arching; in sturdy specimens lower branches sometimes ± fasciculate and repeatedly branched, but usually all branches straight and simple, forming an open, but narrow panicle. Basal leaves lanceolate, acute, their bases broadly or narrowly cuneate, their tips gradually attenuate, their laminas flat or with slightly undulate margins, the leaf stalks ± equal to or rarely longer than the blades. Stem leaves lanceolate, narrowing towards both ends, most of them with flat margins but some slightly crenulate-crispate towards the tip, 4–6 (–7) times longer than broad, smooth and glabrous, with the lateral nerves leaving the midnerve at 40–60° angle. Upper leaves with increasingly shorter leaf stalks and topmost leaves ± linear. Flowers in many-flowered whorls, the lower ones ± remotely leafy, the uppermost almost continuous and perfectly aphyllous. Fruit pedicel narrowly filiform, of varying length, but often 1.5–2 times as long as the mature perigone, and in its lower 3rd or 4th part with a distinct ring-joint. Close to the perigone the pedicel widens to funnelshape, or becomes at least considerably thicker. Outer perigone leaves linear-lanceolate of about half the length or slightly shorter than the valves, to which their margins are pressed. Valves cordate triangular, the base slightly cordate or subtruncate, the tip acute, membranaceous, the surface subregularly reticulate with slightly raised veins, the areas between the nerves elongate towards the margins, which form more or less irregular, sharp and coarse teeth, ±0.5, rarely 1, mm. long, on both sides of the entire-margined tip. Valves (3.5–) 4 (–rarely 5) mm. long, about as broad or rarely somewhat narrower, all with about equally large grains. Grain golden-brown, almost smooth, ovate-ellipsoid, very prominent, the acute tip often running out into and continuing in the median nerve of the valve. The grain is about half the length of the valve and occupies ¼ to ⅓ of its width. Mature nut dark brown, about 2 mm. long and 1.5 mm. broad, apiculate at both ends, the tip somewhat sharper than the base."

Superficially, *Rumex stenophyllus* resembles *R. crispus,* but there are several significant differences. Rechinger (1949) points out, that *R. stenophyllus* possesses two characteristics which never occur in true *R. crispus,* namely valves with distinctly toothed margins and a valve-nervature which forms elongate, flat meshes (cf. fig. 1). The two species were placed in very different sections and sub-sections by Rechinger (1949) and Losina-Losinskaja (1935).

Although *Rumex stenophyllus* was described as a species from Altai by Ledebour in 1830, its occurrence in Europe was obscured for a long time by its casual resemblance to *R. crispus* and *R. obtusifolius*. It has thus been regarded as a variety of these two species, i.e. *R. crispus* var. *dentatus* Schur. or *R. obtusifolius* var. *cristatus* Neilr., or even as only a hybrid between them,

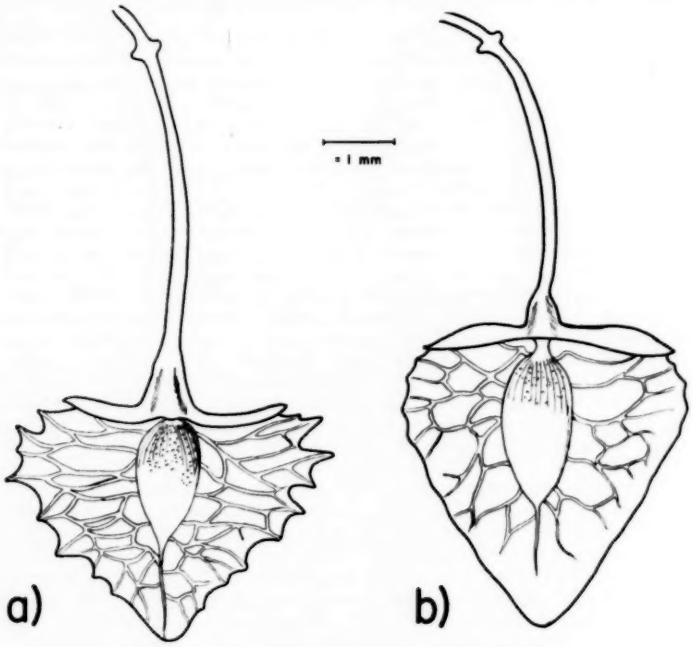


Fig. 1: a. *Rumex stenophyllus* Ledeb., b. *Rumex crispus* L.

R. crispus × *obtusifolius*. Other authors have regarded it as a separate species, *R. biformis* (Menyh.) Borbas, or *R. odontocarpus* Sandór (cf. Mansfeld 1940), thought to be endemic in central and eastern Europe. However, in all recent European manuals, the plant is identified with the Altaian taxon, since the type material of this species does not differ from European material (cf. Rechinger 1949).

Rumex stenophyllus differs from the real hybrid *R. crispus* ×

obtusifolius in several morphological characteristics, e.g. in the shape of leaves and valves. However, the hybrid is always sterile, and the species is fully fertile. The sterility is caused by the fact, that the hybrid has 2n = 50 chromosomes, its parents 2n = 60 and 40 chromosomes, respectively (Löve 1942). *R. stenophyllus*, however, has 2n = 60 chromosomes, as determined by Pólya (1950) on Hungarian material and confirmed on germinating seeds of the Manitoba plants by Mrs. N. Sarkar (unpubl.). There is no reason to suspect, that any of the *R. crispus* × *obtusifolius* hybrids reported from North American localities by Rechinger (1937) belong to *R. stenophyllus*.

A specimen of *Rumex stenophyllus* Ledeb. has been deposited in the herbarium of the Institut Botanique, Université de Montréal.—Doris Löve and Frère Jean-Paul Bernard, o.s.v., Institut botanique, université de montréal and institut des sourds-muets, montréal.

Literature Cited

Clapham, A. R., Tutin, T. G. & Warburg, E. F. (1952) Flora of the British Isles.—Cambridge.

Frankton, C. (1955) Research Report, Canada National Weed Committee, Western Section, pp. 123–124.

Gates, F. C. & McGregor, R. L. (1950) *Rumex alluvius*, a new species of dock from Kansas.—Trans. Kans. Acad. Sci. **53**: 186–189.

Hylander, N. (1955) Förteckning över Nordens växter I. Kärlväxter.—Lund.

Ledebour, C. F. (1830) Flora Altaica 2.—Berolini.

Löve, 'A. (1942) Cytogenetic studies in *Rumex* III. Some notes on the Scandinavian species of the genus.—Hereditas 28: 289–296.

Losina-Losinskaja, A. S. (1935) *Rumex* in Flora SSSR V: 444–482.

Mansfeld, R. (1940) Verzeichnis der Farn- und Blütenpflanzen des Deutschen Reiches.—Ber. Dtsch. Bot. Ges. **58 a**: 1–323.

Moore, J. W. (1957) Notes on flowering plants in Minnesota.—Rhodora **59**: 6–8.

Pólya, L. (1950) Magyarországi növényfajok kromoszómvaszámai II.—Ann. Biol. Univ. Debr. **I**: 46–56.

Rechinger, K. H. (1937) The North American species of *Rumex*.—Field Mus. Nat. Hist. Vol. XVII, 1: 1–151.

——— (1949) *Rumices asiatici*. Vorarbeiten zu einer Monographie der Gattung *Rumex*. VII.—Candollea 12, July 1949: 1–152.

——— (1952) Beiträge zur Kenntnis von *Rumex*. X.—Osterreich. Bot. Zeitschr. 99, **4**: 523–527.

Elatine triandra in New York.—*Elatine triandra* Schkuhr previously was found in the Manual Range in several localities in Wisconsin and in Skowhegan, Maine, (Fasset, Rhodora **41**: 370. 1939). I can now report the species (forma *submersa* Seubert) growing spontaneously in a swamp in Brooklyn, New York City (voucher deposited in The New York Botanical Garden, *Monachino 612*, Prospect Park, near the Music Grove, several dense mats in soft mudbank and shallow water of small over-grown swamp, Aug. 29, 1957; all submerged after rain, Sept. 14). It was confined to several patches in one small area, but thriving vigorously. The stems measured were up to 30 cm. long, the internodes 1 cm.; the opposite scarious-stipulate leaves oblong-lanceolate, up to about 1 cm. long, 3 mm. wide, lightly emarginate at apex; the inconspicuous flowers trimerous; the green tiny depressed-globular fruits plentiful though solitary in the leaf-axils, sessile, 1 mm. high, 1.4 mm. broad, the placenta extending half way up the capsule; the minute, numerous, slightly arcuate seeds (not fully matured) radiating from the central placenta, the upper ones erect, the lower spreading, about 0.5 mm. long, their angular pits about 24 in each row.

The swamp is fed by a brooklet and flows into Prospect Park Lake a short distance away. The yellow floating-heart, *Nymphoides peltatum*, and *Sagittaria latifolia* were the most conspicuous plants near the *Elatine*. Other aquatics nearby were *Chara*, *Hydrodictyon*, *Potamogeton*, *Lemna*. Further off were seen a few plants of *Mimulus guttatus*. The center of the swamp was choked with rice cut-grass. There were large tangles of *Solanum dulcamara*. With *Bidens frondosa* was growing the form of *B. connata* with leaves mostly simple to tripartite. Several other plants but sparsely represented were *Erechtites*, *Lythrum*, *Rumex*, *Polygonum*, *Glyceria*, *Echinochloa*, *Panicum*. The shrubs in the swamp were *Cephalanthus*, *Sambucus*, *Cornus*, *Salix*. It is reasonable to suppose that the *Elatine* is adventive, possibly introduced with the European floating-heart. Quite suggestive of this is the fact that the species (examined, but no complete specimen collected) also was growing in the lily pool in the Brooklyn Botanic Garden.

The discovery of a second eastern station for the waterwort (previously collected more than a quarter of a century ago in

only one place in Maine) is not too surprising. There is a likelihood that this unobtrusive weed is more extensively distributed than records show. However, how frequent it is in our ponds and other fresh water sites remains to be demonstrated. The waterwort has much the aspect of the water starwort, until the details are examined closely. The habit, shade of green, and the leaves even as to their retuse tips are similar in the two aquatics. Of course there are vegetative differences: in *Callitriche* the leaves at the end of the branches are often crowded with the upper reduced to give a rosette or star-like appearance, they have characteristic punctation and are not stipulate; in *Elatine* the leaf-margins are obscurely and remotely punctiform-crenulate. Although it is generally essential in *Elatine* to study the seeds to determine the species (or variety, as understood by Fasset), the leaf-size of our plant is not described for any other species or form in America but *E. triandra* f. *submersa*.—Joseph Monachino, The New York Botanical Garden, N. Y.

Species Plantarum—More Than a Facsimile Edition,[1]—This is a "curious" book—if we interpret "curious" to mean "interesting," following the usage of Gronovius in his reference to the famous Hortus Cliffortianus, interesting and also important to the systematic botanist, who, even today, must constantly refer to the works of Linnaeus. William T. Stearn of the British Museum has done an excellent job of bringing together in an extensive introduction the pertinent material to make not only the works of Linnaeus fully understandable but also the nature, use and limitations of the Linnaean herbarium in typification procedures. Furthermore, he has made clear the bearing and interdependence of contemporary books and other works of Linnaeus on the Species Plantarum. The introduction to Volume I is a treasure of vital information for the student and scholar alike. Perhaps some conception of the range of coverage may be seen from a mere listing of the chapter headings. These are as follows: The nomenclatural importance of the *Species Plantarum;* Principal events in the life of Linnaeus; Major botanical publications of Linnaeus; Linnaeus's sexual system of classification; The *Genera Plantarum* and the typification of Linnaean genera; *Hortus Cliffortianus;* The *Amoenitates academicae* and the authorship of Linnaean Dissertations; The preparation of the *Species Plantarum*

[1] Species Plantarum by Carl Linnaeus. A Facsimile of the first edition, 1753. Volume I, with an introduction of 176 pages by W. T. Stearn. Publication No. 140 of The Ray Society, London, 1957. Sold by Bernard Quaritch Ltd., 11 Grafton St., London, W. 1, £2, S 10.

and the introduction of binomial nomenclature; The reception of the *Species Plantarum* in England and its influence on British botany; Sources, format, method and language of the *Species Plantarum;* Editions and variants of the *Species Plantarum;* Geographical names in the *Species Plantarum;* The species-concept of Linnaeus; Signs used by Linnaeus; General Bibliography. A facsimile of the 560 pages of Volume I of the Species Plantarum plus an added index to genera and classes completes the volume. The value of the index is increased by the inclusion of page references to the 5th edition of Genera Plantarum, with which the names of Species Plantarum are to be associated.

Many points concerning the herbarium materials used by Linnaeus are dealt with in a clear and concise way. Heretofore, much of this information could be learned by the student or young scientist most effectively from older persons through a kind of apprenticeship association with them. Although much information had been written down in scattered places, a great deal of it was essentially unavailable. Part of it got passed on from one generation of botanists to another by word of mouth. This situation resulted, in part at least, from the very complex history of the Linnaean herbarium itself, as well as the other collections that figured in the typification of species described by Linnaeus. This history has only gradually been pieced together. Now, this situation is well taken care of by the material at hand in the very fine volume under review. Assiduous study of the introductory material in this volume should be a must on the list of every young botanist, not to mention some of us who are not as young. Fortunately, the price of the volume is relatively modest and the workmanship on the book itself is of good quality. Many botanists will want to own personal copies I am sure.—R. C. Rollins.

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